A Summary of External Program Evaluation Findings for the eMINTS (enhancing Missouri's Instructional Networked Teaching Strategies) Program From 1999–2009

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Since its inception in 1999, annual external evaluations of the eMINTS program have been conducted to determine the effects of eMINTS professional development (PD) on teacher and student outcomes.[1] Qualitative research and formative evaluations also contributed to a better understanding of the facilitating factors and challenges associated with school/classroom implementations of eMINTS. This document summarizes 10 years of eMINTS PD research and evaluation and assesses the quality of evidence reported. *"eMINTS classroom" refers to classes where teachers complete the full eMINTS PD program and required technology is present.*

Student Outcomes

eMINTS external program evaluations conducted from 2002 through 2005 used quasi-experimental design that compared performance of students in eMINTS classrooms with performance of students in non-eMINTS[2] classrooms.[3] These evaluations consistently found that intermediate elementary students enrolled in eMINTS classrooms significantly outperformed students enrolled in non-eMINTS classrooms on Missouri's state standardized performance measures, the Missouri Assessment Program (MAP), in communication arts,[4] mathematics, science, and social studies. These results primarily pertained to students in Grade 3 communication arts and science and Grade 4 mathematics and social studies, with small sample sizes suggesting similar results may exist at Grades 5 and 6 (Hager, 2004; Hunter & Greever-Rice, 2007; Office of Social and Economic Data Analysis [OSEDA], 2002, 2003a, 2004, 2005; Tharp, Bickford, & Hager, 2005). OSEDA analyses were conducted using student achievement data from MAP to compare the percentage of students attaining proficient and advanced levels of achievement in eMINTS classrooms with the percentage of students reaching those levels in non-eMINTS classrooms. A larger percentage of eMINTS students

[1] Full text evaluation/research reports can be found at www.emints.org/evaluation/reports/.

[2] The primary comparison made in these reports is between students in eMINTS classrooms and students in non-eMINTS classrooms. Thus, those classrooms in schools with eMINTS that are not participating in the program serve as the comparison group. The authors do not explain how or why some classes received the treatment while others did not, leaving the possibility of selection bias as an unaddressed concern.

[3] The number of districts, schools, eMINTS/non-eMINTS classrooms, and students varied considerably by year and subject. For Grade 3 communication arts and science, the number of classes ranged from 25 eMINTS and 76 non-eMINTS in the 2002 report to 42 eMINTS and 55 non-eMINTS in the 2005 report. For Grade 4 mathematics and social studies, the number of eMINTS classes was approximately 60 in all of the reports, while the non-eMINTS classes ranged from 48 to 127. The number of students in communication arts eMINTS classes ranged from about 500 to 800, and non-eMINTS classes ranged from about 700 to 1,500. The number of students in mathematics eMINTS classes ranged from about 900 to 1,300, and non-eMINTS classes ranged from about 1,100 to 2,500. Study schools were located in approximately 35 to 40 school districts.

[4] The Missouri Assessment Program (MAP) in communication arts assesses students' performance in reading, writing, and oral language.

attained proficiency or advanced levels of achievement than did non-eMINTS students in communication arts from 2002–2005,[5] the difference being statistically significant at the .05 level from 2003–2005. Mathematics results are similar, with the only exception being 2004, when non-eMINTS students had a slightly (0.4 percent) higher rate of proficiency. The other three years of mathematics assessment data indicate statistically significant differences in favor of eMINTS students.[6]

More recent evaluations conducted by the Education Development Center (EDC) from 2006–2009 substantiated OSEDA's earlier findings. EDC's evaluations focused on schools that received competitive Title II.D Enhancing Education Through Technology (EETT) grant awards in Missouri. The first study consisted of a sample of about 7,000 students, approximately one third of whom were in treatment classes, spread across 340 classes in 31 districts. Later reports more evenly distributed the number of students in eMINTS classrooms and the number of students enrolled in non-eMINTS classrooms (approximately 6,000 students total per year) across 35 to 40 schools and fewer districts (about 10). These reports of a more established eMINTS program extended to Grades 5 and 6, where students in eMINTS classrooms consistently attained higher rates of proficiency or advanced levels in all grades (3–6) in communication arts and mathematics, with significant results at the .01 level in most comparisons, including Grades 5 and 6 (Strother, Martin, & Dechaume, 2006).

Turning to mean achievement differences in MAP,[7] early reports (2002 and 2003 results) indicate that students in eMINTS classes consistently outscored their peers in non-eMINTS classes as well as all other Missouri students. In communication arts, eMINTS students had higher mean scores across years, with significant differences growing larger each year (from less than one point to more than 10 points) and producing greater effect sizes (.013 to .173). In mathematics, the mean score differential (7 to 10 points) and effect sizes (approximately .25) remained stable and significant throughout the reports. In the first two reports (OSEDA, 2002, 2003a), eMINTS students scored higher in science but not significantly so. The results in social studies are significant, however, and produce effect sizes between .16 and .18.

For all subjects, the magnitude of the gap between eMINTS and non-eMINTS students by group—those with an individualized education program (IEP), in a Title I school, who qualified for the free and reduced-price lunch program (FRLP), minority—was statistically significant and grew over time. Effect sizes were consistently larger for some subgroups, especially students qualifying for FRLP. For example, the OSEDA (2004) analysis of 2003 MAP data reported the following effect sizes: communication arts (.21), mathematics (.19), science (.11), and social studies (.20). Even larger effect sizes were found when student achievement in Schoolwide Title I schools was analyzed: .29, .32, .16, and .25, respectively. These findings were consistent across

[5] The difference in the percentage of students at least meeting the proficient level in eMINTS schools versus those in non-eMINTS schools ranged from 1.0 percent to 12.0 percent.
[6] These three years have a range from 9.2 percent to 9.8 percent in favor of eMINTS students.
[7] Although the report is unclear here, mean differences appear to be at the student level and not the classroom level.

OSEDA reports. In addition, students with IEPs and students with limited English proficiency (LEP) in eMINTS schools outscored their non-eMINTS peers by approximately one standard deviation in each of the four subjects,[8] and the differences in means were statistically significant at the .001 level (Martin, Strother, Weatherholt, & Dechaume, 2008; Strother, Martin, & Dechaume, 2006). "The fact that the effects were most dramatic among the highest-need students suggests that the kind of environments eMINTS teachers create in their classrooms may be particularly effective for these students" (Strother, Martin, & Dechaume, 2006, p. 7).

The original eMINTS intervention was a two-year program. Analyses indicate students of second-year eMINTS teachers significantly outscore non-eMINTS students and students with first-year eMINTS teachers (Martin, Strother, & Reitzes, 2009; OSEDA, 2003c). Results of perhaps the strongest evaluation of eMINTS yet conducted appear to confirm this. Martin, Strother, and Reitzes' (2009) longitudinal analysis of student performance over two years (fall 2007 to spring 2009), utilizing a matched schools design, found that students assigned to eMINTS classrooms during both years significantly outperformed students assigned to non-eMINTS classrooms for both years at Grade 5 in communication arts ($p < .05$) and Grade 6 in communication arts ($p < .05$) and mathematics ($p < .001$). In addition, scores of student having two years with eMINTS teachers compared with students having an eMINTS teacher for only one year[9] were significantly greater in Grade 6 communication arts ($p < .01$) and Grade 6 mathematics ($p < .001$). Moreover, the variance explained by having two eMINTS teachers was sizeable, especially for mathematics (23.8 percent).

As described earlier, a decade of evaluation on eMINTS consistently has shown promise in changing elementary teachers' practice and raising student achievement. In particular, these results were found to exist among intermediate elementary students representing a range of demographics, in communication arts, mathematics and social studies, and in more than 40 school districts across Missouri.

Teacher Outcomes

eMINTS PD is designed to help teachers learn how to integrate technology into their teaching, use instructional strategies that promote standards- and inquiry-based learning, and encourage collaboration and community building among students and teachers. One of the earliest reports from Missouri's Office of Social and Economic Data Analysis (OSEDA, 2001a) presented the results of surveys taken by the first cohort of eMINTS teachers and administered at three different points throughout two years. In these early self-reports, teachers reported improvements in their inquiry-based teaching activities, their computer usage, and their perception of computing skills. A second report that focused on teacher change in lesson

[8] Communication arts, mathematics, science, and social studies.

[9] Separate analyses were run for students with teachers receiving eMINTS in Year 1 and teachers receiving eMINTS in Year 2. Results were nearly identical.

typology through multiple observations found that after one year of eMINTS implementation, participating teachers transitioned from teacher-centered models to hybrid or student-centered models (OSEDA, 2001b). Furthermore, early evaluations (OSEDA, 2003b) demonstrated a positive relationship between eMINTS training on inquiry-based learning strategies and teachers' enactment of those components in their practice.

Using an observation scale to measure classroom climate, early eMINTS evaluations also found evidence suggesting that eMINTS teachers who facilitated student-centered instruction were significantly more likely to construct a well-ordered and effective learning environment than those who were less focused on facilitating student-centered instruction (OSEDA, 2003c). Subsequent research demonstrated that eMINTS teachers' instruction became increasingly student-centered, and their classrooms became increasingly linked to effective behavior management strategies (Tharp, 2004). Similar findings were observed among principals participating in the eMINTS program (Tharp, 2006) that more frequently engaged with students and increasingly monitored student achievement and progress.

More recent eMINTS program evaluations have placed a focus on program fidelity and its impact on teachers' mastery (Martin et al., 2009; Martin et al., 2008). EDC's Center for Children and Technology's 2008 external evaluation found high levels of fidelity in terms of program delivery, and teachers demonstrated high levels of mastery on classroom technology integration and inquiry-based learning strategies. These high levels were found in programs implemented primarily under the direction of eMINTS staff members as well as those implemented under the direction of district-level instructional specialists who had satisfactorily completed or were actively participating in the eMINTS "train-the-trainer" program called Professional Development for Educational Technology Specialists (PD4ETS). The evaluation also found significant positive correlations between program fidelity and teacher mastery scores on eMINTS lesson planning procedures and the WebQuests teachers submitted as part of program participation requirements (Martin et al., 2008). Specifically, the following factors of program fidelity were correlated with lesson planning at the .01 level of significance: scaffolding instruction (.263),[10] active work/learning (.296), modeling instruction (.388), technology utilization (.268), connection to practice (.217), and inquiry-based learning (.205). EDC's (2009) evaluation substantiated these findings, adding that "evidence [suggests] that the more closely aligned the local implementation of eMINTS is to core program goals, the greater the impact the program has on teachers' understanding of the material and on students' performance on standardized assessments." For example, in communication arts and mathematics for Grades 4 and 5, correlations between PD fidelity and student achievement is significant at the .05 level[11] in both 2007 and 2008. Of the various components of PD fidelity, technology utilization and inquiry-based learning became more strongly correlated with student test scores in both communication arts and mathematics as grade levels increased (Martin, Strother, Beglau, Bates, & Reitzes, in press).

[10] Correlations in parentheses.
[11] And often the .01 level.

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